

THE AMERICAN JOURNAL OF UROLOGY

VOL. II.

APRIL, 1906.

No. 7

A CONTRIBUTION TO THE STUDY OF RUPTURE OF THE BLADDER.

By DR. E. LOUMEAU, Bordeaux, France.

RUPTURES of the bladder may be divided, from the etiologi- cal standpoint, into three classes. Sometimes they follow a traumatism, accidental or surgical; sometimes they take place spontaneously on account of the pathologic change of the vesical walls; and lastly they may arise from the two preceding mechanisms and occur upon the occasion of an insignificant traumatism, in subjects having a bladder which has been pathologically affected for some time. Then again, this accident may occur without any external cause in patients possessing a bladder having undergone changes in its structure or relationship on account of a former traumatism, which may date back for a more or less lengthy period.

Thus, we have traumatic, pathologic and mixed ruptures of the bladder, relative to which I have no pretension of entering into a detailed study, for that matter perfectly well known at the present time, but of which I merely desire to relate a few cases which I have observed each of which come under one of the three principal varieties above mentioned.

The first case is that of a man 57 years of age, who, for several years had had nephritic colic and who came to consult me in October, 1903. He complained of suffering during micturition, the acuity of which, as well as the frequency of the desire to empty the bladder, was exaggerated by fatigue and excessive movement. In the night all the pain stopped, but not the pollakiuria, which, for some months obliged him to get up five or six times in a night. Three weeks ago after being exposed to cold, the

patient was seized with complete retention, the bladder being emptied with a large catheter. Catheterization was extremely painful and gave rise to hematuria, which lasted for a week.

When I saw the patient for the first time, just after a trip on a railroad train of several hours, I found a large well colored and built subject who passed in my presence some rose colored urine, which gave rise to considerable stinging at the end of micturition. Catheterization done with a metallic olive bougie No. 20 (Charrière) showed in the first place that there was no urethral stricture and after it penetrated into the bladder a large hard and smooth calculus was at once discovered just behind the neck, in all probability composed of uric acid. Rectal palpation, which was at once undertaken, showed a marked turgescence of the hemorrhoidal veins and, below the bladder, a distinct lobulated projection, which was renitent, evidently being merely the prostate in a state of congestion.

Lithotrity was at once proposed and accepted, but it was postponed by the patient for a short time on account of the necessity of arranging certain family affairs before submitting to the operation.

About two weeks later, November 16, I was called by telephone to the country, some distance from Bordeaux, to do an immediate laparotomy. I left at once, and arriving at my destination learned that the patient was the same person who had consulted me two weeks previously for the vesical calculus and who had agreed to submit to lithotrity, but two days previously he had undergone the operation at home by his physician, who, for that matter, was well up in everyday surgery and who called me himself at the request of his patient. Lithotrity had been laborious and the calculus was crushed into about two hundred pieces, four of which had a diameter above 4 cm., the fragments being removed with the aspirator; then a sound à demeure was placed in the urethra. But as soon as the patient came out of the anesthetic he complained unceasingly of an intolerable feeling of painful tension in the lower abdomen, a sensation which did not disappear, while the catheter did not give exit to any urine, in spite of repeated vesical irrigations which were given, so that it had to be withdrawn a few hours after the operation. The abdomen swelled more and more, giving rise to an increasing

anxiety with an inextinguishable thirst that was not overcome by the incessant absorption of liquids, which were perfectly well tolerated by the patient and did not give rise to vomiting.

At the time I arrived at the patient's house, at about half past three in the afternoon, I found him in extreme agitation, the abdomen greatly distended and very painful, with a copper colored edema of the entire posterior lateral walls of the abdomen. His face was pinched and covered with cold perspiration, the pulse was small, about 136 a minute; the temperature was 39° C. The patient had neither vomited nor rendered a single drop of urine since the operation, which had been done forty-eight hours previously. The diagnosis, unfortunately only too evident, was septic peritonitis following an intra-peritoneal rupture of the bladder produced during lithotripsy. On account of the gravity of the septic accidents, which would carry off the patient very shortly, there seemed to be little hope that immediate laparotomy would accomplish much. However, the patient's family having been warned of the immediate dangers of the situation, I opened the abdomen without delay, under chloroform narcosis. As soon as the bladder had been exposed it appeared in the field of operation having a dead leaf color, while its tissues which were very soft, tore upon the slightest manipulation. After having opened it in the median line, it was found empty and in the left wall was an irregular opening about the size of the end of the little finger; then behind, in the small pelvis, there was a large quantity of decomposed urine mixed with altered blood. I endeavored to remove this liquid with gauze sponges, after which the cavity was irrigated with very hot water. The rent in the bladder was then closed with catgut, while the organ was left freely opened in the median line, stitched to the abdominal incision, and a large drainage tube surrounded with gauze was placed in the peritoneal cavity on the left and brought out just above the pubis. Hypodermic administration of salt solution, caffeine and ether were then given, and the patient warmly enveloped was transported to his bed. In spite of every effort he died within a few hours from the progress of the septicemia, which had in no way been influenced by the too tardy interference.

My second case was a lady 59 years of age, whom I was asked to see two months ago by my distinguished confrère, Dr.

Durand, Physician to the Bordeaux Hospitals. She had always enjoyed excellent health and neither in her hereditary nor personal antecedents was there anything to note until May, 1905. At this time she commenced to suffer in the lower abdomen, which was painful and somewhat distended in the right iliac fossa. Then vomiting set in and there was a slight rise in temperature, which confirmed the diagnosis of appendicitis. Rest in bed, diet and the local application of ice resulted in a rapid recovery from all the symptoms, but for several weeks the patient continued to present nonequivocal symptoms of localized peritonitis in the right iliac fossa, which finally disappeared gradually.

In June she left for Poitou, where she intended to remain a month and up to this time the patient, who had never experienced anything abnormal in the urinary apparatus was taken towards the 20th of June with spontaneous hematuria, which recurred for several days following, at the same time being accompanied with a frequent desire to urinate, which resulted in the painful expulsion of some small phosphatic débris. In July she passed a rough, whitish calculus, the size of a bean. On July 14th a vaginal examination was made, which revealed the presence of a deep-seated induration over the anterior vaginal wall, which, given the antecedent lithiasis already mentioned, was attributed to a vesical calculus. This diagnosis was not long in being confirmed, at least partially, by a direct examination, which Dr. Durand asked me to perform on the 11th of September.

I found the patient pale and thin, passing her urine almost continually, the latter being both bloody and puriform, the act being extremely painful. By vaginal examination I was able to discover the presence of a very hard infiltration, very sensitive to pressure, occupying the two upper thirds of the vaginal wall and appearing to be due to a deep-seated infiltration propagated from the bladder, primarily the seat of the trouble, and secondarily involving the vagina. Combined abdominal and vaginal examination only increased the pain without revealing any appreciable tumefaction in the cavity of the bladder, on account of the fat abdominal walls. Nothing could be found in the uterus, adnexa, iliac fossae, nor in either kidney. There was no suspicious lymphatic enlargement in the groins, nor could I perceive any enlarged pelvic glands by deep abdominal palpation.

A metallic explorer introduced into the bladder at once hit

against a rough stony mass giving rise to the characteristic sound which could only be obtained by a phosphatic calculus.

The diagnosis was not doubtful. It was only too evidently a malignant neoplasm involving and infiltrating the lower vesical wall which had become ulcerated, complicated with cystitis and secondary phosphatic calculi. The present condition did not appear to have any connection with the former attack of appendicitis already referred to and which at the time of my examination had already disappeared leaving no trace, unless, a thing which appeared hardly probable, one was dealing at this time with an acute pericystitis, which had extended to the peritoneal serosa and had developed under the influence of the already existing, but still latent, vesical tumor which had not given rise to any symptomatic manifestations. In case this latter hypothesis were correct, but which, I repeat, appeared to me much less admissible, the pelvic peritonitis had only become accentuated and more marked, instead of progressively disappearing as it had done here.

I proposed immediate removal of the calculus by lithotrity, which only kept up the cystitis and the patient's sufferings, but I refused any interference upon the vesical growth. However, in case of intolerable pain, one might be forced to perform a cystotomy in order to give relief.

After crushing I withdrew several fragments of calculus contained in the bladder by means of a pair of clamps introduced through the meatus, the total mass representing the size of a large walnut. An abundant irrigation of warm water was given after the removal of the stone. Sitz baths were ordered, with suppositories of opium and belladonna, urotropin and a milk diet with the hope of diminishing the vesical infection as well as the frequency in the desire and the pain during micturition.

At the end of eight days the patient was seized with a permanent incontinence of urine which put an end to her desire to pass urine and to all her sufferings. The urine, however, did not cease to be bloody, thick and fetid. The destruction of the sphincter by the extension of the malignant ulceration was not capable of attenuating the urinary infection as it did the painful manifestations, which had disappeared for good.

On the eleventh of October, the patient who for several weeks had been relieved of all pain on account of the incontinence

with continual evacuation of the urine which she supported with ease, was taken with uncontrollable vomiting of food, bile and mucous, against which all classical treatment was powerless. After one week of this intolerable situation, which had greatly undermined the patient, who had become unrecognizable on account of loss of flesh, a sudden pain occurred in the lower abdomen with an awful acuity which caused the unfortunate woman to continually cry out. The vomiting became incessant and more severe, the matter being greenish and poraceous, the face became pinched, the integuments cold, while the horrible suffering was not calmed by suppositories given frequently during the day, nor by morphine. Finally, after twelve hours of torture, the like of which I have never seen, the patient fell back exhausted on her bed and died.

A very acute peritonitis from perforation had complicated the truly alarming progress of the vesical neoplasm, which, during several weeks had given evidence of its centrifugal development through the bladder walls to the peritoneal serosa.

The third case that I am desirous of recording is that of a female 44 years of age, whom I presented cured before the Society of Medicine and Surgery of Bordeaux on October 27, 1905. The patient was sent to me from Perigord two months previously with serious septicemia, the result of a septic urinary phlegmon in the cavity of Retzius, following an extra-peritoneal rupture of the bladder. At the age of fourteen, the patient while still a child—since she did not have her menstruation until her seventeenth year—was the victim of a blow on the lower abdomen from the shaft of a wagon, the traumatism being inflicted just above the symphysis pubis, a little to the right. A violent pain was immediately felt, which obliged the child to stop walking for a time and has never disappeared since. The pain was aggravated by fatigue and the many pregnancies which followed later and one in which the abdomen became unusually large, gave rise during the two latter months of pregnancy to such dragging sensations in the hypogastric region that the patient was obliged to give up all work and even remain seated or lying down with the body bent forward. Beside this, attacks of complete retention of urine or vesical paresis, occurred on several occasions, especially following a voluntary continence of urine when somewhat prolonged.

On August 20, 1905, there was an acute retention which lasted eighteen hours and necessitated catheterization, which did not result in complete satisfaction on the patient's part. From this time on there was frequent desire to pass water, but there was no change in the urine, which had always remained absolutely limpid. On August 23rd after effort in vomiting, which lasted all the day and continued the following night, efforts which were prolonged by the administration of castor oil, the patient was suddenly seized with a sensation of something rupturing internally at the point in the hypogastrium the seat of the former traumatism and which had never ceased to cause suffering since the date of its receipt. At the same time she was taken with an imperious desire to pass water, which gave her the presentiment that this time she would void a large quantity of urine. She passed, in point of fact, more than half a potful, but, as it was in the night and as the vessel was immediately emptied, she was not able to identify the nature of the liquid voided. Whatever it may have been, the fact remains that from this time, the urine, which before had always been perfectly clear, became bloody, then a dirty red and extremely nauseous. On the other hand, the desire to urinate became frequent and the act painful, while the lower abdomen was appreciably distended and tender but no vomiting occurred. However, on account of the aggravation of the local symptoms and the progressive change for the worse in the patient's general condition, she was brought to me on September 4, 1905.

Upon examination she was found delirious, very thin, skin dry, clay colored and hot, the face pinched and an expression showing that she suffered much, the urine chocolate colored with the most repulsive fetid odor. The lower limbs, the perineum and the abdomen up to the waist were edematous. The lower abdomen was very distended showing a median forward projection, oval in shape, resembling a seven months pregnant uterus which extended up to the umbilicus; the integuments covering it were rosy in color and edematous, having an erysipelatous aspect. By catheterization with a soft rubber male catheter, the instrument being inserted to the extent of 30 centimeters, a pyogenic and bloody liquid made its exit, which came away in quite a considerable amount without giving any relief to the suffering of the patient and made no change in the abdominal swelling.

Believing that I was dealing with a septic urinary infiltration in the prevesical cavity, produced by a rupture of the bladder, giving rise to a general septicemia, which would very soon kill the patient, I immediately made a long hypogastric incision under chloroform. I was thus able to remove about 2 litres of a fluid having the same character as that drawn by the catheter, along with numerous clots mixed with purulent necrotic débris. The cavity thus evacuated, and without attempting to search for the vesical perforation, a large drain was introduced under the abdominal wall and a strip of gauze along with it, after which the wound was covered with a thick layer of absorbent cotton.

The postoperative result was of a remarkable simplicity. The next day the temperature fell below 38° C. and never rose above this again. The edema rapidly disappeared and the incision closed by granulation. At the end of a few weeks the patient passed all the urine by the urethra. On October 25th cystoscopic examination showed that the vesical mucosa was normal throughout its entire extent, excepting at one point in the anterior wall, a little to the right of the median line, where there existed a small rosy cicatrix, the size of a millet seed, evidently resulting from the spontaneous obliteration of the vesical rupture which had completely healed. As I have already said, on the 27th of October I showed this patient at the Society in absolutely perfect health, passing her urine normally.

As to the pathogenesis of this case of rupture of the bladder, which is not the most curious side of the patient's history, it appears to me due to the breaking away under the strain of vomiting, of a segment of the bladder, which had been bound with fibrous adhesions to the abdominal wall. These adhesions had without doubt succeeded the formation of a prevesical hematoma produced by the contusion which the patient received thirty years previously, the result being a circumscribed and localized pericystitis at the site of the traumatic focus.

Such are the three cases of bladder rupture that I have been desirous of recording in this note and which are sufficiently instructive in themselves for me to dispense with any very long comments.

The first, which was an instance of traumatic rupture, but of an operative surgical nature, shows that lithotripsy may in hands inexperienced in this marvelous and ordinarily inoffensive opera-

tion, produce a laceration of the bladder and, on account of not having repaired the accidental lesion, resulted in a peritoneal infection which was rapidly mortal. This is, without any doubt, a very rare mishap, which in no way militates against lithotripsy itself, which is, and it cannot be too often repeated, one of the most brilliant and surest conquests of urinary surgery. But this unfortunate complication proves at least that, in order to be performed with security it should only be undertaken by an experienced surgeon, otherwise it should give way to cystotomy, which is much more within the reach of an inexperienced operator.

The second case, which is an example quite typical of pathologic, spontaneous perforation of the bladder, shows the very rapid and invading evolution and perforation of a vesical cancer, susceptible of bringing about a hyper-acute peritonitis by an intraperitoneal rupture.

And lastly, the third case, is an example of mixed rupture of the bladder, spontaneous in appearance and, in reality produced by a double mechanism very easy of appreciation. A hypogastric traumatism received many years back resulted in a contusion of the bladder with a prevesical hematoma, following which fibrous adhesions resulted between the bladder and the abdominal wall. These adhesions caused the constant pain and very disagreeable dragging sensation during several pregnancies as well as the parietic disturbances of the bladder which were a hindrance to physiological evacuation of the organ. These adhesions under the influence of violent and repeated movements finally broke away from the walls of the bladder at their point of implantation on the organ, from which resulted a tear in the latter with all the consequences that were given in the history of the case. This rupture consequently had the straining effort of vomiting as a determining cause, but it also and above all had as a very important predisposing cause the prevesical adhesions resulting from the traumatism received in early years.

From all this one may conclude that a contusion of the hypogastrium, very simple in appearance, may to a certain extent be held responsible for a perforation of the bladder occurring thirty years later. Independently of this notion, which is not without some practical utility, the present case appears to me to be a document of a certain value for a chapter absolutely unexplored up to the present of contusions of the bladder.

CONSERVATIVE SURGICAL TREATMENT FOR CERTAIN CASES OF ENLARGED PROSTATE.

By FOLLEN CABOT, M. D.

Attending Surgeon to the New York City Hospital (Genito-Urinary Department).

THE method I advocate here for what may be termed perilous or emergency cases suffering with prostatic hypertrophy is not a new one. It is akin to nephrotomy followed by a nephrectomy.

The plan is first to do a cystotomy, preferably by the perineal route. Sterile water to be used for local anaesthesia. This whole operation should not occupy more than five minutes. We have in this manner usually obtained good drainage, with practically no shock. Good bladder drainage is the crying need of prostatic cases. The patient is thus placed in a position of bladder rest and he should improve in every way. In a week or ten days if his condition warrants it a prostatectomy may be performed by the perineal or supra-pubic route. The preliminary cystotomy will have enabled the trained surgical finger to determine this important question.

Before describing the class of cases which to my mind should be treated by this two-stage method of operation, I will quote the opinions of two surgeons who have had very large experience with prostatic cases. Howard Lilienthal says he believes thoroughly in this two-stage method of handling certain of these difficult cases. He says he never does an emergency prostatectomy. Eugene Fuller on the other hand believes such a method absolutely unsafe and never uses it. Both of these surgeons have had exceptionally good results. I firmly believe there is room for this two-stage method and shall now define the class of cases where in my opinion it should be the method of choice.

In an appreciable percentage of patients suffering from the effects of enlarged prostate the vital organs have been so damaged that even moderate surgical shock is quickly followed by death.

I have divided these cases into two groups. In the first group I include all individuals whose vitality has been so reduced by years of mechanical obstruction to normal urinary drainage that the limit of resistance has been reached. These men are worn out and tottering on the brink. No severe operation could be successful until they are in better condition and put in some shape to withstand the surgical shock. In suitable cases of this division very able men, among them Orville Horwitz, use the Bottini operation with excellent results. In many cases the prostatic obstruction is too large or unsuited to this procedure. The main argument brought forward by those employing the Bottini method is that in selected cases it accomplishes the purpose of prostatectomy by providing good urinary drainage, without so seriously menacing the patient's life as a complete removal of the prostate would. I have so far had no personal experience with the Bottini operation but in skilled hands it undoubtedly has a distinct place in prostatic surgery.

In the second group of cases I include all those who after prolonged prostatic disease suddenly become totally unable to urinate. In other words an emergency arises which must be immediately met if the patient's life is to be saved. The catheter has been tried and from one cause or another found useless or unsafe. The man's general condition is in most instances very bad and severe surgical shock seems sure to be attended with a fatal outcome. In deciding what is best to do in cases belonging to these two groups good judgment is of the utmost importance. In no other class of individuals is the surgeon's judgment and skill more severely tried. A consideration of the past history of the case with a study of his present crisis, his vital organs and his resistive power must all be carefully weighed. An opinion as to the best method for relief must be quickly given and then rapidly acted upon. Is he able to endure a prostatectomy? In my opinion the answer to the question for these two groups of patients is emphatically, no. As a rule the vitality is too low and while a patient might pull through the chances are against him. It is not fair in my opinion to put him to the severest test. He has complications usually affecting the kidneys or arterial system, as a consequence of the prolonged prostatic obstruction. What he needs is free urinary drainage, rest and the building up of his

exhausted vitality. His damaged organs need rest before additional strain is put upon them. The prime and immediate need can usually be best attained through a quick perineal cystotomy with sterile water anaesthesia. This should require not more than five minutes. If for some reason this route cannot be selected the suprapubic route should be substituted. This point can readily be determined by the use of a urethral instrument. If the patient's condition is so feeble that he cannot endure this slight shock he certainly would not have survived a prostatectomy. The drainage resulting from this method is usually perfect and the urgent situation is quickly met and temporarily solved. The man is now put to bed, given freely of water; the necessary stimulants are prescribed and the enfeebled damaged organs given a chance to rest and improve. Irrigation used according to the state of the bladder. The urine is measured and thoroughly studied.

The use of calomel and urinary antiseptics to be employed as indicated. The patient should not lie in one position but better be propped up in bed a day or two and then put into a reclining chair. By the aid of the finger at the time of the cystotomy the size and position of the prostate has been accurately determined. By this means the operative route can be readily decided. In the course of a week or perhaps longer, if the condition has improved, a complete prostatectomy can be carried out. By this method the patient has received two little shocks instead of one big one. The second operation should be done with more celerity than it could have been without the previous cystotomy. In a prostate of average size and consistency the time for its enucleation should not be more than 15 minutes. The route will depend upon the position of the enlargement, its size and consistency. The perineal route in my opinion is the one of choice; it is less productive of shock and convalescence is more rapid. In operating by either route I now use *continuous hot irrigation through the penile urethra*. If much haemorrhage ensues adrenalin chloride can be effectively used by the same channel. The advantages of this method of irrigation are that we can use it continuously without interfering with the manipulation of the hands about the wound, and it tends to markedly lessen haemorrhage and so decrease the shock. At the end of the operation and before the patient leaves the table he receives 15 minims of

adrenal chloride subcutaneously, also an enema of hot saline solution and brandy.

At the best these two groups of prostate sufferers are perilous cases. I therefore urge a trial of the method which I have successfully used a few times. In my opinion it should be resorted to more frequently than has been the case with prostate surgery in the past.

129 EAST 31ST STREET.

INJURIES TO THE VENA CAVA DURING NEPHRECTOMY.

By DR. ISIDORE SAGOLS,

Of the Faculty of Medicine of Montpellier, France.

A STUDY of the various recorded cases of injury to the vena cava during nephrectomy shows that the lesions of this vessel are due to several causes. Anatomically, the right kidney and vena cava are contiguous and this relationship is rendered more intimate by the development of renal neoplasms. From the changes that it gives rise to in the neighborhood, the pathologic development of these tumors shows how the operative conditions change, how the difficulties of the interference increase and how possible it is to injure the vessel.

In a few words I will review the topographical anatomy, which will distinctly establish the relationship of the organs situated in this region, after which will be given those cases which have so far been reported in literature, including notes of two cases which were kindly given me respectively by Dr. Heresco, chief of the genito-urinary service of the Filantropia Hospital and Dr. Houzel. We will then consider the pathologic anatomy, as well as certain operative conditions, and will endeavor to explain the manner of production of these injuries.

Formed by the union of the primary iliac veins, the inferior vena cava commences on the right side of the vertebral column, at the level of the disc separating the fourth and fifth lumbar vertebrae, or a little lower at the fifth vertebra, slightly below the

end of the aorta (Poirier). From this point it travels vertically upward along the vertebral column to about the twelfth dorsal vertebra; at this level it becomes deflected to the right in order to reach the posterior border of the liver. Of the course followed by the inferior vena cava beyond this point I shall say nothing; that portion situated below the diaphragm is of interest to us only, for the simple reason that we are to study injuries to this vessel during operative interferences for the removal of the kidney.

The inferior vena cava has a greater calibre than the aorta and consequently it is the largest vessel of the body. At its origin its diameter is 20 mm., 30 mm. above the renal veins and 34 mm. above the supra-hepatic veins. On account of these dimensions wounds of this vessel were formerly considered mortal and operative lesions of this vessel are to be considered the most dreaded complication arising during nephrectomy.

The vena cava is the common trunk into which all the veins of the sub-diaphragmatic portion of the body enter.

Its intra-abdominal relations may be summed up as follows: in front it is in relation to the posterior border of the mesentery, to the third portion of the duodenum, the head of the pancreas, the portal vein and posterior border of the liver. Inwardly it accompanies the abdominal aorta, from which it is separated by only a few lymphnodes. I would particularly insist on the presence of these lymphatic glands along the internal aspect of the vena cava, firstly, because they are always involved in renal neoplasms and their removal is often a difficult matter on account of the possibility of injuring the vena cava; and secondly, because these enlarged glands, by the resistance they offer to the progress of the neoplastic process, may easily compress the large venous trunk, thus reducing its calibre and preparing an increase in the collateral circulation. Outwardly, the vein is in relationship with the psoas muscle on the right side, the ureter and the internal border of the right kidney and suprarenal capsule. The relationship of the internal border of the kidney and vena cava is intimate and it is readily understood with what facility renal tumors during their development may surround the vessel and contract very tough adhesions with it.

At the level of the hilum of the kidney the vena cava re-

ceives the right renal vein, which is much shorter than the left one; this vein becomes involved at an early date in cases of renal neoplasms. By the renal vein injuries to the vena cava become possible, because wounds of the former at its point of entrance into the vena cava may be considered quite as serious as wounds of the vena cava itself. The hilum of the kidney contains numerous lymphatic glands which are always enlarged in cases of a renal neoplasm, surrounded in the meshes circumscribed by the vessels of the pedicle. When very adherent their removal is most dangerous and is a cause for injury to the vena cava.

The topographical anatomy shows that of all the organs the inferior vena cava is the one presenting the most intimate relationship to the kidney, while pathologic anatomy will show that of all the organs this vessel is the one which will first undergo the influence of the development of a renal tumor. In point of fact every form of renal growth develops slowly, even insidiously, and if hematuria, which should be considered as the alarm signal, does not cause the patient to consult a physician, the neoplasm continues to grow until pain becomes severe and the functional disturbances distinctly evident.

A right-sided renal tumor, which alone interests us, occupies a position which is useful to be familiar with and absolutely necessary to understand. "Lying backwards on a thick layer of muscles and aponeurosis which form a resisting envelope, protected above and below by bony surfaces, the last rib and the iliac crest, it meets in this direction an obstacle to its expansion during its growth" (Guillet). Above, the renal tumor cannot continue its extension because it is prevented by the liver and consequently the growth becomes incased on all sides by very resisting barriers so that a single opening remains, namely the latero-abdominal route; it always extends in this direction, pushing the intestinal coils towards the median line. From this fact a renal growth becomes an abdominal tumor. A neoplastic kidney never forms a lumbar tumor, a fact most important to bear in mind.

It can easily be understood that a neoplastic mass produces during its development more or less intense disturbances in the abdominal viscera. The peritoneum reacts by chronic inflammation and adhesions become established. So long as the renal neoplasm is completely encapsulated, round and distinctly

limited, it only gives rise to phenomena of compression of the vena cava, of which we will have more to say later on.

However, the characteristic of renal tumors is that they become adherent to the neighboring structures very early in their evolution. The adhesions may be such that it is occasionally impossible to separate the wall of the vein from the tumor, a condition which is well illustrated by the case recorded in 1884 by Whitehead, where so little space existed between the inferior vena cava and the kidney, that it became necessary to place the ligature on the neoplasm itself. Much patience is required to break up and cut through all the adhesions and much skill is necessary to bring the operation to a favorable outcome. The slightest roughness, or a too brusque movement given to the tumor, may result in a large rent in the vena cava, because, curiously enough, neoplasms more frequently invade the walls of the vessels and the encephaloid in particular soon breaks through its capsule and involves the vessels of the hilum and from here to the vena cava or directly to the vena cava itself. In order to give an idea of this propagation to the vessels, I would recall Rohrer's statistics; out of 50 cases of renal tumor 12 times there was extension to the inferior vena cava, 9 times to the renal vein and 3 times the mesenteric glands.

This propagation is mentioned in some of the cases here reported (Schede, Manteuffel). These authors found a neoplastic nucleus on the wall of the vena cava and in order to do as radical operation as possible they proceeded to extirpate these foci. In similar cases their conduct is to be imitated and it is absolutely indicated to deliberately wound the vena cava. The pathology of renal neoplasms shows that beside accidental wounds there are others which are absolutely inevitable.

The anatomic relations are, as we have seen, profoundly changed by the development of renal growths, while the difficulties of operation are also increased. All operators, who have wounded the vena cava during nephrectomy, were dealing with voluminous tumors. In point of fact these renal growths are often enormous; the sarcoma removed by Lücke measured 21 centimetres in length, 11½ centimetres in breadth, 9 centimetres thick at its lower pole and from 3½ to 4½ centimetres at its upper half. Schede, Bottini, Houzel and Heresco have all met with

growths the size of a child's head at term, while Manteuffel met with a neoplasm the size of an adult's head. Besides, all these authors mentioned the numerous adhesions present which united the neoplastic mass to the neighboring organs and to the vena cava in particular. No matter whether one is dealing with sarcoma, carcinoma, or pyonephrosis, the right hypochondrium is always completely filled by an extremely adherent tumor, and, under these circumstances, extirpation of the latter is very difficult. Section of the adhesions is arduous on account of the depth in which one works, and occasionally, the ground can only be covered millimetre by millimetre, as in Bottini's case. In Lücke's case the tumor suddenly gave way from a too sudden traction on the part of the surgeon, rolled out of the abdomen on to the floor. A severe hemorrhage of black blood indicated a tear of the vena cava. Houzel also, in delivering a tumor through the abdominal incision, tore the vena cava and immediately a flood of black blood inundated the field of operation. Section of the adhesions is not the only difficulty to overcome, because the lymphatics of the hilum are always involved and their dissection is extremely delicate and full of peril. I should mention in passing, certain neoplastic extensions which arise very frequently in various forms of malignant tumors of the kidney, which may surround the vessels of the hilum and the vena cava and, from the very tough adhesions resulting, they may become a source of injury to the vena cava during operation.

CASE I. (Lücke). In July, 1880, the patient presented himself stating that for some time he had noticed an increase in size of the hypogastric region and had noticed a feeling of hardness on the right side. It was only latterly that he lost flesh, with slight anorexia and pains in the hypogastrium. The patient was pale, but the general condition good. In the right lumbar region a tumor the size of an ostrich's egg could be detected. It appeared to be smooth, painful on pressure and was easily moved upwards, downwards, and towards the median line. The right lumbar region certainly offered less resistance than the left when the patient was standing or lying. Urine normal.

A diagnosis of sarcoma of the kidney was made, but it was difficult to decide whether or not the kidney in which it had developed was a movable one. Operation was decided upon and

a median incision made, beginning just above the umbilicus. As the intestines covered the tumor they were pushed to the left and the peritoneum over the tumor was incised. There was a slight loss of blood and the cut vessels were ligated. The tumor, which was very movable, was enucleated with the fingers, this being accomplished without much loss of blood. The hilum was then sought for and an attempt made to isolate it with the fingers in order to include it in a silk ligature. While the tumor, which was very smooth and slippery, was drawn upward in order to apply the ligature, it suddenly tore away and fell to the ground. Immediately a flood of dark blood filled the abdominal cavity. The wound was immediately packed with gauze sponges and pressure brought to bear with the hand. The pulse and respiration did not change. Compression was continued for a few minutes and then the strips of gauze were cautiously withdrawn one after the other. A cord of tissue several centimetres in length could be felt and after being grasped in clamps the hemorrhage stopped. The abdominal cavity was carefully cleaned and the pedicle and several other strips of tissue were ligated with catgut.

After having waited a sufficient length of time to be convinced that the hemorrhage had definitely stopped, the abdominal cavity was closed. The evening of the operation and the following morning there was no rise in temperature, the abdomen was lax and painless. Two liquid movements. No vomiting. Pulse soft and moderately rapid. In the evening there was no temperature, but the patient was nauseated and had not as yet voided urine. Abdomen soft and painless. During the night there were cold sweats, liquid stools, but no urine in the bladder. On the next morning the temperature was up, pulse small and rapid, frequent nausea, some vomiting, patient's mind clear. Collapse finally took place, accompanied with an increase of watery diarrhoea and intermittent vomiting. The patient died on the fourth day after the operation, although there was not the slightest sign of peritonitis.

CASE 2. (Schede). Patient 48 years of age, well and appearing to enjoy flourishing health. At the age of 15 years he had nephritis and during the Autumn of 1887, upon the occasion of a fall, he experienced a violent pain in the right renal

region. On the next day there was hematuria which lasted for eight days, considerably weakening the patient. Dating from this day the hematuria recurred with variable frequency and without appearing to change the general condition of the patient, it had become particularly aggravated for twenty days previous to his coming under observation. Blood and elongated vermiform clots were passed by the urethra, the latter appearing to have been molded in the ureter and, while coming down this canal, they gave rise to a very sharp pain.

Upon examination, a rounded, large and solid tumor was found on the right side behind the ascending colon which could only belong to the right kidney. Operation was advised and accepted. An incision 20 centimetres in length, parallel to the twelfth rib, was made starting from the anterior border of the sacro-lumbar mass of muscles. When the tumor was exposed another incision had to be made in order to resect the twelfth rib which was required by the size of the neoplasm. The peritoneum was then incised and the tumor freed little by little with the hand. After this had been accomplished the pedicle was found so short that the vessels of the hilum could not be ligated separately. It was consequently included in an elastic ligature and the tumor cut away. Examination of the stump showed that there still remained a few bits of tumor and that part of the wall of the vena cava had been included in the ligature. When the peritoneal wound had been closed, detachment of the vessels from the remainder of the tumor was tried and a sufficient bit of the renal artery was isolated so that it could be tied. As to the vein it was no longer isolated.

As Schede did not wish to leave a lateral ligature on the vena cava, the vessel was compressed above and below the point of ligature and the latter being then removed, attempt was made to again free the walls of the vessel. The result was a very severe hemorrhage coming from the left renal vein. With two clamps, whose ends met at the middle of the vessel, the solution of continuity was closed and the hemorrhage stopped. What still remained of the tumor could now be removed and it was then found that there was a rent 20 millimetres in length in the vena cava. This was closed by catgut sutures without difficulty, after which the clamps were removed, the hemorrhage had com-

pletely ceased and a perfect permeability of the vein was noted. The wound was plugged with iodoform gauze and the abdominal incision closed.

For the first few days following the operation everything went well, but the patient began to rapidly decline and suddenly died. Autopsy showed that death was due to an acute fatty degeneration of the heart and other organs, but what is more interesting, was the condition of the inferior vena cava. Upon incision it was found filled with liquid blood, as well as the left renal vein. Opposite the left renal vein, at a point where the right renal vein should enter, a cicatrix was distinctly seen. It was present in the form of an arc, having only a slight convexity, about 2 centimetres in length and formed a projection into the lumen of the vena cava, which slightly obstructed its lumen; this narrowing, although quite marked, did not seem to have hindered the circulation. At the point of cicatrization, both the external and internal layers of the vessel were completely and solidly adherent, the internal layer was intact and nothing would lead one to suppose that a thrombus had formed.

CASE 3. (Helferich). The notes of this case were taken on a woman 57 years of age, who, for about a year, had noticed a tumor on the right side of the abdomen, which latterly had rapidly increased in size. The pain was not severe, but at certain times the patient experienced a feeling similar to what might result from pressure or from a heavy body. There was polyuria and from time to time the urine contained much albumen. The patient was frequently seized with desire to vomit and vomiting did occur as soon as pressure was exercised over the tumor. The colon was pushed towards the median line and covered the tumor anteriorly. General condition satisfactory.

On November 3, 1895, the right kidney with the tumor were removed, but during the operation the ascending vena cava was torn, the resulting rent being closed by a ligature. The patient hardly voided a few cubic centimetres of urine after the operation, death occurring two days later.

At the autopsy no metastases could be discovered in the other organs, the left kidney being normal.

CASE 4. (von Manteuffel). Patient 49 years of age had been in good health up to September, 1898. At this time he

complained of pains in the right flank; there was anorexia and tendency to constipation. Micturition was free, but the urine dark colored; no hematuria. The patient had lost much weight at this time.

Examination March 12, 1899. The patient was thin, medium size, skin and mucosa pale. Heart and blood vessels in good condition, although many vessels present a slight degree of sclerosis. Pulse 100. Temperature 36.9° C. The end of the nose slightly violet in color. Nothing in the lungs excepting a vesicular murmur. Between the right flank and the anterior superior iliac spine the abdominal wall projects. By palpation, a rounded, hard and smooth tumor can be felt, larger than a child's head. The lower limit of this growth does not reach the anterior superior iliac spine; the upper limit extends to the liver and is not easily mapped out by palpation. Towards the median line the tumor extends down to the vertebral column, its limits being difficult to make out. The same condition in the lumbar region. No ballottement, although the tumor can be moved in every direction and follows the respiratory movements. By percussion it cannot be easily separated from the liver. The convexity of the growth is covered by the colon; to its left there is no resonance. Tumor painful on pressure. No venous stasis, no edema.

Urine slightly cloudy and acid, no albumen nor sugar; traces of indican. Microscopically uric acid crystals, granular casts and renal and bladder epithelial cells are found. Total amount in twenty-four hours 1200 to 1300 cc.; Sp. gr. 1,015.

From its situation, size, form and evolution, the tumor was considered as a renal carcinoma, but, during the operation, the surgeon thought he was dealing with a tumor of the liver.

March 17, 1899. Incision made from the border of the great dorsal, above the twelfth rib and carried in a slight curved direction directly over the tumor up to the external border of the rectus. After incision of the abdominal wall, the fat capsule of the kidney was exposed and was found infiltrated with carcinomatous masses. After having exposed both poles of the kidney the ureter was laid bare, a double ligature applied, after which it was cut away. The renal vessels were then isolated between two ligatures and after ligature of the pedicle the kidney was found

adherent to the vertebral column. From this it resulted that the peritoneum and colon were displaced upwards; the peritoneum was opened and then it was found that the tumor was adherent to the vena cava, presenting a pedicle 6 cm. broad and 1 cm. thick, or, in other words, the pedicle crossed the wall of the vein retaining these dimensions. The tumor sent a prolongation into the lumen of the vein which measured 10 centimetres in length and more than a finger's breadth in thickness. It was decided to extirpate the growth from the vena cava. It was essential to prevent any bit of the tumor becoming detached and carried off in the blood current and in order to obviate this occurrence, a clamp was placed directly under the diaphragm on the vein, just above the prolongations of the growth in the vena cava.

The tumor was then cut away leaving a sufficient amount of the pedicle which remained adherent to the vein. This was then seized and an incision was made in the healthy portion of the walls of the vein around the carcinomatous focus, during which an assistant compressed the vein against the vertebral column. However, when the pedicle was completely removed a gush of blood inundated the wound because compression of the renal vein on the opposite side had been neglected. This was done and the opening in the vena cava sutured. After this, compression being removed, a very trifling leakage was noticed and to control this, the connective tissue was sutured over the sutured opening in the vein. The hemorrhage then stopped and the blood continued its course through the vessel, although, at the point of suture, its calibre had been reduced to almost one-half. Compression of the vena cava had lasted fifteen minutes and the pulse, which had been good up to this time, became poor and hardly perceptible. Two minutes after the clamps had been removed the pulse became stronger and of good quality. The operation was then rapidly finished by the closure of the wound and packing with iodoform gauze. The operation lasted 64 minutes.

The patient recovered so well that by the 16th day he could sit up in bed and on the 18th in a chair, while on the thirty-ninth day after the operation he left the hospital, the urine at this time being perfectly normal.

CASE 5. (due to the courtesy of Dr. Houzel). Female, 36 years of age was seen for first time in May, 1900. She had

been well up to December, 1899, at which time she began to complain of her abdomen and cough. A physician rapidly cured the cough, but, as she continued to suffer, had an elevation of the temperature and not being able to urinate, she consulted another physician, who prescribed Epsom salts. After several doses she urinated, but noticed that the urine contained pus and glairy matter. The abdominal pain increased and we saw the patient on May 27, 1900.

She was a small, thin woman with withered skin. Heart and lungs normal. She was septicemic, with a temperature of 40° C., obstinate constipation and complete anorexia.

In the right flank a tumor the size of an adult's head could be found, distinctly fluctuating and projecting towards the lumbar region and passing slightly beyond the median line. A line of resonance separated the growth from the liver, while over it a slight resonance indicated the colon flattened between the abdominal wall and the tumor, which was retroperitoneal and could only arise from the kidney. The urine, which was voided in a normal amount, was full of pus.

Nephrotomy was done on May 30th, about 3 litres of fetid pus being evacuated from the kidney. Drainage. The next day the temperature was normal and the urine did not contain pus. A week later the patient returned to her home under the care of her physician. She returned at the end of April, 1901, in a worse condition than when she left the hospital. She was thinner and cachectic. The drainage tube had not been changed once and gave issue to a very large amount of fetid pus. The tumor had increased in size, filling the entire right flank and reached downwards to the anterior superior iliac spine.

On May 3, 1901, she was anesthetized and it was decided to remove the kidney. When the peritoneum was reached, separation of the tumor with the finger was attempted, but it was so intimately adherent to the appendix and ascending colon that it was ruptured. The intestines were pushed to the side and carefully walled off with gauze. The upper part of the wound was also walled off in order to isolate the liver which appeared in the wound at each respiratory movement. In order to give more working space the incision was carried backwards parallel to the iliac crest and detachment of the deeper parts of the tumor to-

wards the abdominal cavity was continued. Decortication was quite advanced, the ureter had been cut between two clamps, when suddenly traction on the tumor having made it project through the wound, a flood of blood appeared at the bottom. The wounded vessel was seized between the left thumb and index finger and a clamp was applied above and below the opening. After cleaning out the wound it was found that the vena cava had been torn to the extent of a centimetre, the rent being seated on the anterior aspect of the vessel, two fingers breadth below the renal vessels. Suture of the opening in the vein with catgut was very difficult on account of the depth at which it lay in the wound and from the hemorrhage which continued. Finding that this was not sufficient to stop the hemorrhage the vessel was lifted up by two ligatures placed under it and it was then solidly ligated above and below the opening and then the flow of blood completely stopped. The renal vessels were then isolated and tied off separately and with the knife the pyonephrosis was completely removed without the slightest contact with the wound. The ureter was then tied off and the clamps removed. A drain was placed in the lower angle of the wound and the abdomen closed.

The kidney was as large as a child's head at term and was composed of a series of separate pockets containing thick, fetid pus. The after history of the case was uneventful and the patient left the hospital completely cured on May 20th. Other than a slight edema of the limbs, the general condition was perfect.

Seen again on June 15th the venous circulation was found perfect and there was no more edema of the legs. The abdomen was flat and painless. She was again seen at the end of July, 1902 in excellent condition.

CASE 6. (Bottini). Female 40 years of age. Affection dates back three years, she having experienced in the spring of 1890 a pain in the right flank for the first time. This pain increased little by little and occurred in such fearful attacks that she was obliged to remain in bed and she entered the hospital April 13th, 1892. The patient was greatly reduced in flesh. Thoracic organs normal. She has been troubled with indigestion for a few months past, occasionally accompanied by attacks of vomiting. Nervous system presents nothing abnormal, although the patient is greatly depressed. Uropoiesis offered no phenomenon which

would justify the diagnosis made. Quantitatively and qualitatively the urine was normal. However, after four days in the hospital a trace of sugar was detected, which disappeared by diet.

In the right hypochondriac region was found a resistant, round body, about the size of a child's head at term, smooth and fibromatous in consistency. Three-quarters of its circumference could be circumscribed, while the fourth appeared fixed, irregular and adherent. The free portion followed the respiratory movements. Pressure was painful. Bimanual examination of the renal region was prevented by the tumor, which was interposed forwards between the hand and the right kidney. Behind, one felt a uniform pastiness which was impossible to outline. Physical exploration gave rise to no sign capable of enlightening the diagnosis.

Operation April 25th. An incision was carried over the tumor into the right hypochondriac region parallel to the median line and two fingers breadths on the outer side of it. The incision measured 12 cm. After the peritoneum was opened the intestines were pushed aside and the tumor was palpated. The tumor was freed forward and on the sides until about two-thirds of the growth was freed, but, in order to reach the deep posterior adhesions, it was necessary to increase the incision 3 cm. downward. Little by little the tumor was freed, when suddenly a flood of blood inundated the field of operation. Large gauze sponges were introduced into the abdominal cavity in order to clean out the wound and then the bleeding vein was seized in an angiotribe and afterwards ligated with a stout ligature. The vena cava had been torn, but at the time it could not be ascertained whether this accident was an accessory occurrence, independent of the extirpation of the tumor or not. A few more applications of the angiotribe were sufficient to isolate the tumor in its entire circumference and it was then removed. It was then possible to explore the field of operation and much to the astonishment of all we found the right kidney in its proper place, only much smaller than normal, the atrophy being certainly due to the pressure that the tumor exercised upon it. It was the peripheral extremity of the vein which had been rent and three or four centimetres higher up one could see the end of the central segment of the vessel

which was also ligated but appeared less swollen than the lower end and formed an enormous turgid swelling of a dark violet color. The portion of the vein between the two ligatures had remained adherent to and was removed with the growth.

Microscopically the tumor proved to be a lympho-sarcoma with small cells contained in a fibrous capsule.

To make a long story short the patient after a long convalescence, during which a secondary abscess was opened, finally recovered and was seen some months after the operation in a very satisfactory condition.

CASE 7. (Due to the courtesy of Dr. Heresco). Female 47 years of age. Entered the hospital May 7, 1902, with the diagnosis of right-sided calculous hydronephrosis. Both parents are dead, the mother at the age of 40 from pneumonia, the father dying at 60 from cancer of the liver. Patient has had 11 children. At the age of 7 or 8 she had enlarged glands which suppurated.

Three years previously while pregnant at the fourth month, she fell down a staircase and aborted three weeks later. About eight years ago during the summer she was seized with severe cramps in the abdomen, but after medical treatment the pains suddenly disappeared. One or two weeks afterwards the pains became localized in the right hypochondrium. At this time she felt a lump which disappeared at the same time as the pain.

Five years ago the patient was taken with severe pain in the right hypochondrium and found a large tumefaction, which in the first place was hard, but became soft and fluctuating. An incision was made over the hypochondrium at the level of the umbilicus and a large amount of pus evacuated. The patient was well in two weeks.

A year afterward, at the point where the incision had been made, pains were experienced and another smaller incision gave issue to more pus. After this a fistula resulted, which gave exit to pus for three years. Three months ago the fistula closed and in its place a slight prominence the size of a walnut, soft and fluctuating made its appearance.

Micturition was painless, but imperious. Never any hematuria nor icterus. The fistula again opened and since then the patient has felt better and free from pain in the hypochondrium.

Examination. In the right hypochondrium at the border of the rectus at the level of the umbilicus was found a fistulous tract which allowed the probe to enter three or four centimetres. In the right flank was a tumor which gave rise to ballottement and extended upwards as far as the liver and downwards to a horizontal line passing through the umbilicus. This tumor was smooth.

On May 9th examination of the urine showed the presence of uric acid, a density of 1.020, urea 23.44 gm., traces of albumen, no sugar, no biliary pigments. Abundant deposit, largely composed of pus. No renal elements.

On May 15th catheterization of the ureters was done and an examination of the urine coming from both kidneys was made with the following result. Left kidney: 300 c.cm. marked greenish color, almost transparent, acid. Less amount of sediment. Sp. gr. 1.032. Urea, 16.64 gm. per litre. Chlorides, 18 gm. per litre. Phosphoric acid 2.5 gm. per litre. Albumen. No sugar nor biliary pigments. Microscopically, numerous uric acid crystals colored green. No pus nor blood. Urine from right kidney: 300 c.cm. slightly greenish in color. Cloudy. Acid. Very abundant sediment. Sp. gr. 1.010. Urea. 6.04 gm. per litre. Chlorides 6 gm. per litre. Phosphoric acid 0.872 gm. per litre. Albumen 1.5 gm. per litre. No sugar nor biliary pigments. Microscopically, very large number of pus cells.

Methylen blue was injected and an hour afterwards the urine from the left kidney showed a clear green color; the maximum of intensity of the coloring occurred four hours after the injection, while twenty-four hours later it was hardly colored. The urine from the right kidney gave hardly any coloration six hours afterwards, the maximum of its intensity occurred twelve hours after the injection; the last elimination occurred twenty-four hours afterwards with the same intensity as the preceding. Chromogen appeared $5\frac{1}{2}$ hours after the injection and was hardly perceptible. Duration of the elimination was forty-eight hours.

Operation May 17th. An incision was made in the right hypochondriac region, two centimetres from the outer border of the rectus muscle and parallel to it. The fistula was included in the middle of this incision. The anterior border of the liver covered the tumor, the latter being adherent to the peritoneum,

which was reddish. The growth was freed with difficulty and during the decortication, when the hilum was reached, a vein was torn. The hemorrhage was free and in trying to stop it it was suspected that the vena cava was involved. The vessel was compressed with the fingers, the intestines pushed aside and it was found that it was the vena cava. A ligature was thrown around the vessel above and below the focus of the hemorrhage and the latter was controlled. Separation of the growth was then continued with and nephrectomy accomplished. The wound was thoroughly packed with gauze.

The patient having lost a considerable amount of blood was given a litre of salt solution.

The patient was discharged completely cured on June 10th.

Out of these seven cases there were four where a cure was established (von Manteuffel, Bottini, Houzel, Heresco), one case (Schede) which may be considered as having a successful outcome, because he lived for 17 days, death being due to another cause, and three cases of death. Consequently, in 57% of these cases a cure was obtained. These results are certainly much to the honor of contemporary surgery, but the severe hemorrhage which arises at the time of rupture, the difficulty of applying clamps above and below the wound in the vessel if the tumor is still in the abdomen, the hemorrhage from the left renal vein, are all conditions which diminish the chances of recovery. The prognosis of wounds of the vena cava has always been considered fatal. De la Motte and Dupuytren thought that it was impossible to overcome the hemorrhage arising from these wounds, while at a later date Delorme and Nélaton professed the same teaching and it may be said that the same doctrines were still valid at the commencement of the antiseptic era.

In 1880, Lücke having injured the vena cava ligated the vessel; the patient died of uremia. In 1892, Schede attempted suture of the rent and seventeen days after the operation death occurred from another cause and at autopsy cicatrization of the wound in the vessel was found to have taken place. In 1895, von Manteuffel resected a portion of the wall of the vena cava measuring 9 centimetres in length and $2\frac{1}{2}$ in width on account of a neoplastic focus which had grown into it. The vein was sutured and the patient recovered. In 1893, Bottini performed total

ligature of the vena cava which was followed by recovery and in 1901 and 1902 two cases of total ligature followed by recovery were done respectively by Houzel and Heresco. There are undoubtedly other instances which have escaped our notice. However, we have during the last ten years greatly improved the prognosis of lesions of the vena cava. It is evident that wounds of this vessel will always give rise to a high mortality but we now know that they may be dealt with and the patients recover.

When in presence of a hemorrhage arising from an injury to the vena cava, hemostasis is to be accomplished in the way that circumstances will permit, either by digital compression and, if possible afterwards, by clamping the vein above and below the rent. In order to avoid injuring the walls of the vein, both branches of the clamp should be covered with rubber drainage tube. As soon as the hemorrhage has stopped, the wound should be cleaned out and the lesion examined carefully. It is evident that if resection of the wall of the vein is necessary it should be accomplished between two clamps. Several procedures may be employed, namely, compression, temporary clamping, lateral ligature, suture and total ligature and we will now examine the value of each one of these methods in cases of injury to the vena cava.

Compression cannot be employed. The arrest of the hemorrhage is due to the formation of a thrombus, which obliterates the vein along a certain extent of its course and for a vessel having the calibre of the vena cava an obliteration over such an extent will of necessity prove fatal.

Temporary clamping should be seriously considered and this method has given rise to long discussions between Schede and Niebergall, the first believing in the superiority of suture, the second proclaiming the greater value of clamps left in place for twenty-four hours. It is possible that, in all cases where the clamps may be left in place, where one can watch the patient carefully so as to remove them upon the slightest indication, this procedure gives good results; but in cases of wounds of the vena cava it would be very audacious, not to say imprudent, to leave clamps on.

Another intervention requiring anesthesia will also be neces-

sary; after twenty-four hours the clot is not sufficiently solid to resist coughing or vomiting and is a very serious argument against temporary clamping. There are, in point of fact, cases where, during the extirpation of a tumor, usually instances of renal neoplasms, the wall of the vein has become involved in the process and must be resected. Clamping is then of no use, because the instruments would obturate the lumen of the vessel. For all these reasons temporary clamping should be discarded as a method of treatment.

Lateral ligature has been employed in one case of injury to the vena cava (Helferich), the patient dying forty-eight hours after the operation. This procedure has been rejected by Nélaton, Malgaigne, Langenbeck and Braun on account of the very important fact that it exposes the patient to secondary hemorrhage when the ligature falls off at about the fifth to the seventh day.

The frequency of this accident can be explained by the extreme tension to which the wall of the vein is subjected after lateral ligature. In point of fact, one cannot accomplish lateral ligature so as to insure hemostasis without including a large portion of the walls of the vessel and from this results a very intense traction on the surroundings of the wound; then again catgut may slip very easily and the result is a secondary hemorrhage. An experiment performed in 1895 by Villar and Brachet confirms this. After having exposed the femoral vein in a dog the vessel was pricked with a knife. The tiny opening was seized with a clamp, over which a lateral ligature of fine silk was applied. Five days latter a very severe secondary hemorrhage occurred which would have killed the animal if the wound had not been immediately plugged with gauze. This experiment also showed that blood tension was extremely marked at the level of the ligature. There was a marked stricture of the vessel and the blood current did not appear to be reestablished at this point.

There are cases where lateral ligature cannot be employed, namely, when the injury extends over more than one-third of the circumference of the vein.

It has been shown that none of the preceding procedures of hemostasis are applicable in the treatment of wounds of the vena cava. Alone, suture of the wound is proper which assures per-

fect permeability of the vessel. It was referred to by Nicaise in 1872 in Gensoul's thesis, where he advises to discard this treatment in wounds of veins. Vinay in his article on "Veins" in Dechambre's Dictionary, relates two cases of suture, one due to Lister, the other to Czerney, and advises having recourse to ligature or forcipressure. Lateral suture was attempted unsuccessfully by Gluck, but in 1881 Hirsch of Vienna successfully accomplished circular lateral suture on the femoral and internal jugular veins, but was unsuccessful on the femoral artery. The animals were killed a month later and he found the vessels were permeable and their calibre only slightly diminished. In 1890 Mayr performed suture of the vein which gave excellent results, while in 1891 Niebergall advised temporary clamping. In 1892 Schede published numerous cases of suture of the veins, one of which being the vena cava and to which allusion has already been made. Rickard in 1892, Romme in 1893, Paul Kay and Tikoff in 1894, Brachet and von Manteuffel in 1895, Murphy in 1897, Kümmel in 1900 and Clermont in 1901, have related numerous instances of suture of the veins followed by recovery. The latter mentioned authority has also published several cases of circular suture of the vena cava in dogs. The animals survived and at the end of a month the vessels were found permeable, but with a distinct narrowing of their calibre at the point of suture. This authority concludes that he has always been able to reestablish the permeability of the vein and that the true factor of success is asepsis. According to him, an aseptic foreign body projecting into the lumen of a vein does not produce thrombosis, which is the accident to be feared.

As soon as a jet of black blood indicates a wound of a vein no time should be lost in arresting the hemorrhage, either by digital compression applied at each side of the rent, or by a temporary double ligature or elastic clamps. After this has been accomplished suture is done as in any ordinary wound. Schede sutures without paying attention to the disposition of the tunics of the vessel; Mayr considers that the juxtaposition of the different layers of the vessel is indispensable for a successful outcome. We believe that this exact approximation is of no importance, because Tikoff found that cicatrization had taken place in instances where an exact approximation of the tunics of the vessel wall was not

realized. A continuous suture is considered the best by Mayr, Tikoff and Schede. Von Horoch prefers a round needle and fine silk instead of catgut. In order to better assure hemostasis it is better to suture the neighboring structures, such as aponeurosis and muscles, over the sutured vessel.

We have related two cases where suture was attempted and in one of them autopsy seventeen days later showed that cicatrization was complete. In von Manteuffel's case, where resection of the vessel wall followed by suture was done, the patient recovered. If these clinical results are compared with those obtained by experimentation it is to be remarked that suture of the vein is an excellent method of treatment.

Physiological experiments have always been a useful adjunct and an indispensable auxiliary for both the physician and the surgeon. By showing the effects of such and such mutilation in animals, experimental physiology has given to surgery the extent to which it may proceed with very precise indications.

Ligature has always been the procedure of choice in cases of wounds of veins and by this means a definitive hemostasis is obtained. The question, however, arises up to what point this procedure is applicable in the case of large veins? Should not one fear in the case of the vena cava sudden death of the patient following a sudden interruption of the circulation in such an important vessel which brings back the blood to the heart from more than one-half of the body? In other words, can the inferior vena cava be ligated? Such is the question which physiologists have endeavored to solve experimentally. In 1880 Picard read a short note at the Academy of Science of Paris on the phenomena consecutive to ligature of the inferior vena cava performed above the liver and he says: "The animals always died after this operation, this termination occurred at variable times according to the animal, varying between half an hour to three or four hours.

"The immediate phenomena are those produced by a severe hemorrhage.

"The ultimate results are also similar to those observed in a sudden anemia; they consist, in the first place, in an arrest in the respiration, following which the pressure continues to drop. The number of systols diminishes, likewise their amplitude, and in a minute or two there is a complete secondary arrest of the heart's action.

“The cause of these anemic phenomena is revealed by the study of venous pressure of the infradiaphragmatic vascular system. In point of fact, at the time the ligature is applied and at the same time that tension of the carotids diminishes, one observes an increase of the pressure in the veins of the lower limbs and peritoneal cavity, and this increase persists until death.”

These observations show that the blood is less abundant in the upper regions, because it is immobilized in the infradiaphragmatic system after the operation. The nervous centres, the respiratory muscles, heart, and so forth, are consequently exactly in those conditions in which they would have been placed if this immobilized blood had been removed from the organism by a hemorrhage.

It will thus be seen that experimentation absolutely rejects ligature of the inferior vena cava. For that matter it is precisely from this time (1880) that surgeons attempted suture of the vein whenever there was a lesion of this vessel. But suture is not always possible and thus in 1893, Bottini ligated the vena cava in a case where suture of the vessel was unsuccessful. Contrary to all hope, the patient recovered.

This fact passed without hardly being noticed, but it gave rise to interesting studies by Dr. Purpura, who endeavored to explain the discord between clinical observations and the results obtained by physiological experimentation. It is therefore proper to relate these experiments.

Purpura published a very important work on experimental ligature of the inferior vena cava. He tried sudden ligature and slow ligature on dogs. The latter alone resulted in recovery of the animals by giving time for the supplementary circulation to become established and after a very large number of experiments he formulated the following conclusions: (1). In some cases, in dogs, recovery is possible after immediate ligation of the inferior vena cava at any point from the junction of the primary iliac vein up to the liver; death is more apt to occur when the ligature is placed above the point of entrance of the renal vein. (2). Stenosis of the lumen of the vena cava prepares a favorable soil for complete obliteration. (3). The orifice of compensation, if the obliteration is situated just below the renal vein, is assured by the anterior extra spinal vein, the left utero-ovarian and the uterine, and secondly by the inferior mesenteric vein and

those of the abdominal wall. If the obliteration occurs above the entrance of the renal vein, the circuit is reestablished by the vessels of the renal capsule, by the extra spinal vein, the inferior mesenteric and those of the abdominal wall.

He demonstrated by numerous experiments that the preceding development of a collateral circulation prepares a favorable soil for complete obliteration of the inferior vena cava, and that, *even in certain cases, in dogs and bitches, the animals may recover when a sudden ligature of the inferior vena cava is made.*

Wishing to control these experiments myself I performed with Prof. Forgue a laparotomy on a dog and ligated the inferior vena cava below the entrance of the renal veins. The animal was chloroformed. After a period of weakness which lasted several hours, the animal presented nothing abnormal. There was no edema of the lower limbs and no circulatory disturbances. He ate well and lived for twenty days, but, unfortunately, through some error, an autopsy was not done.

Another dog was submitted to sudden ligature of the vena cava just above the renal veins and as soon as the ligature was tightened, an intense congestion of the kidneys, a diminution of the cardiac impulse and a decrease in the respiratory movements were noted. The animal presented evidences of profound adynamia, but an hour and a half afterwards he was able to stand up. Death occurred rapidly in three hours. We will make no comments on this case and leave it to physiologists to discover the reasons which produced such a rapid death.

If, to these experimental results, we add those obtained clinically, it will be seen that in the four cases where immediate ligature of the inferior vena cava was done, three of the cases survived and recovered. Lücke gives no indication as to where he applied the ligature on the vein in his case. The ligature was placed below the renal veins by Bottini and Houzel, while Heresco does not state at what point the ligature was applied, although it would have been interesting to know. But the important fact is that, out of four cases of ligature of the vena cava there were three recoveries, while physiological experiments could hold out no hope for such a result. There is here a contradiction, perhaps only apparent, but which must be explained. Without doubt, the collateral circulation in dogs is not as developed as in man,

but beside this there are other reasons which allow one to surmise how life has been possible in cases of sudden ligature of the inferior vena cava in man.

In the three cases of total ligature the surgeons were dealing either with a neoplasm of the kidney or an enormous purulent pocket which had developed in the gland itself. It was always noted that the tumor was adherent to the vena cava, and it is very likely that, in all the cases, this vessel was compressed by the neoformed mass. Now, in point of fact, are these not the conditions realized in the case of gradual ligature? The tumor soon commences to press on the walls of the vessel and diminishes its calibre and lumen. The presence of this gradual stenosis is an obstacle to the passage of the blood and a factor in the development of collateral circulation. The complementary veins become more and more dilated as the pressure exercised by the tumor on the large venous trunk becomes greater. The supplementary venous supply will be ready to take up the work of the vena cava as soon as its obliteration is complete. Consequently, ligature of the vessel only continues and achieves the natural obliteration which the constant increase in the size of the tumor would have inevitably brought about.

To sum up, it may be said that in man, anastomoses between the portal circulation and that of the vena cava will be sufficient to assure the return of the blood to the heart after obliteration or ligature of the vena cava. In the female all observers recognize a very great influence and a marked preponderance of the uterine and ovarian venous plexuses, as well as a great importance to the utero-ovarian vein.

These remarks are most instructive if we take into consideration the fact that the three cases of ligature of the vena cava recorded in this paper were in females, that is to say, in persons where a special complementary venous system existed, a system prepared to undergo an increase in size by all the phases of genital life.

In passing I would like to quote the curious remark made by Vimont in his thesis on obliteration of the inferior vena cava: "When the inferior vena cava is obliterated at its lower third, facts tend to prove that the circulation becomes reëstablished by the perietal veins (Sappey, Dumontpallier, Goetz, Meisner,

Kahler, Parisot, and so forth), and in the female by the uterine, utero-ovarian, ureteral and renal veins, that is to say by the visceral veins."

Consequently, in the female, it is not infrequent to see the circulation become reëstablished by the ovarian vessels when the obliteration involves the lower portion of the vena cava. Hallett has related a case where, after obliteration of the cava, the right utero-ovarian vein reëstablished the intercepted circulation. In a case reported by Parisot the left ovarian vein attained the size of a goose's quill, it was tortuous and emptied into the emulgent vein. Kundrat met with a case in which, following old obliterations of the entire inferior vena cava and the right pelvic veins, the left ovarian vein had reached the size of a loop of small intestine.

A very important fact from the surgical standpoint has been acquired, namely, that there are two methods of treatment of injury to the vena cava, namely, suture and total ligature, which have given satisfactory results. The other procedures, namely, compression and lateral ligature, do not merit to be considered, because the inconveniences do not compensate the advantages derived by their use.

As to temporary clamping I cannot recommend it. The removal of the clamps twenty-fours later necessitates a second interference, and after this lapse of time, the clot may break up if the patient vomits or has a coughing spell. Consequently, too much risk is taken if this means of hemostasis is employed.

There now remain suture and ligature, and it is necessary to settle their respective indications. I would remark at once that total ligature is easier of execution than suture, on account of the depth of the wound. It goes without saying that I do not advise ligature in all cases, although experimentally and clinically it would appear devoid of much danger. I would willingly advise total ligature in cases of wounds of the inferior vena cava when the vessel is injured below the point of entrance of the renal veins and in every case where one can apply the upper ligature below the renal veins. But when the opening occurs in the vena cava at the entrance of the renal vein or above it, when the wall of the vein to be resected extends very high up, ligature appears to me absolutely contra-indicated. To ligate the vena

cava above and below the renal veins would be fatal, as physiology shows.

LITERATURE.

- Albarran:—De la conduite à tenir dans les déchirures de la veine cave au cours des opérations sur le rein. *Société de Chirurgie*, 24 decembre, 1902.
- Albarran et Imbert:—1902.
- Brachet:—Thèse Bordeaux, 1895.
- Braun:—*Deut. med. Wochens.*, 1881, Nos. 31, 32, 33.
- Casse:—Thèse de Montpellier, 1897.
- Clermont:—*Presse Médicale*, 1901. Suture des veines.
- Duplay et Réclus:—*Traité de Chirurgie*.
- Forgue:—Rapport au Congres d'Urologie, 23 octobre, 1902.
- Forgue et Réclus:—*Traité de Chirurgie*.
- Guillet:—*Tumeurs malignes du rein*. Th. Paris, 1888.
- Gluck:—*Arch. f. klin. Chir.*, XXIV.
- Heresco:—*Société de Chirurgie*, 18 decembre, 1902.
- V. Horoch:—*Allgem. Wien. Ziet. med.*, 1888.
- Helferich:—*Virchow Archives*.
- Houzel:—*Revue de Chirurgie*, 1903.
- Kummel:—*Wiener med. Presse*, 1900.
- P. Kay:—Kiel, 1894.
- Lecerclé:—Th. Lyon, 1902.
- Von Leppen:—*Hahneman Month.*, Philad., 1893.
- Lücke:—*Deut. Zeitsch. f. Chir.*, Bd. XV., p. 514, 1880.
- Mayr:—*Ueber die Venennaht*, Dissert. inaug. Erlangen, 1890.
- Meredith:—*Semaine Médicale*, 1884, pag. 440.
- Murphy:—*Med. Rec.*, New York, 1897.
- Nicaise:—Th. d'agregation, 1872.
- Niebergall:—*Deut. Zeits. f. Chir.*, 1892.
- Pacinotti:—*Gaz. de Osp.*, Milano, 1893.
- Pascale:—*Riforma Medica*, 1901.
- Picard:—*Compte rendu de l'Academie des Sciences*, 1880.
- Purpura:—*Riforma Medica*, 1901, 3, pag. 306.
- Quénu:—*Traité de Chirurgie*. II, 192.
- Ricard:—1892.
- Gaston Rollé:—Thèse Paris, 1901, Contrib. à l'étude des lésions traumat. de la veine cave inférieure.
- Romme:—*Gazette hebd. de Médecine et de Chirurgie*, 1895. Suture des veines.
- Max Schede:—*Arch. für klin. Chir.*, 1892, vol. XLIII, p. 338.
- Tikhoff:—*Annales de Chirurgie* (Russe), 1894, IV.
- Tmazza:—*Riforma Medica*, 1894.
- Whitehead:—*Brit. Med. Journ.*, 5 nov. 1881.
- Vimont:—Th. Paris, 1890.
- Vinay:—*Art. Veines* du dict. Dechambre.
- Villar:—*Société d'anat. et de physiol.*, de Bordeaux, 1895.
- Zoge V. Manteuffel:—*Centralblatt für Chirurgie*, 1899.

CORRESPONDENCE.

NEW YORK, Feb. 11th, 1906.

Editor, "*The American Journal of Urology*," Boston, Mass.

DEAR SIR,—In your valued Journal of October, 1905, an article by Dr. Frank M. Johnson, entitled; "Lavage of the renal pelvis in the treatment of lithaemia, pyelitis, forms of nephritis, with notes of illustrative cases," attracted considerable attention.

Knowing Dr. Johnson as I do and admiring his progressive ideas, I approach with some hesitation a criticism of his paper. I would not do it if I did not feel that a signal of warning is necessary. The subject of lavage of the renal pelvis has been recently discussed extensively in the various medical journals and even in the lay press. In the hands of the inexperienced and unprincipled the method is open to many objections. Until the treatment of various kidney lesions by irrigation of the pelvis has become an accepted form of treatment, I firmly believe statements that it will cure chronic parenchymatous nephritis are both misleading and dangerous. From this general statement I exclude certain conditions of the renal pelvis in which Howard Kelly and others, after years of painstaking work have demonstrated pelvic lavage to be of undoubted value. Beyond this point, in my humble opinion, we have not yet found a safe harbor. Dr. Johnson says: "Case after case could be cited in which the diagnosis of sub-acute or chronic parenchymatous nephritis, supported by clinical deductions and by microscopic findings, could be regarded as a certainty and in which internal medicine has proved of little worth. Now, since irrigation of the kidney has been practiced, the picture in these cases is changed. Casts, disintegrating epithelium, and similar elements have disappeared from the urine, a healing process has supplanted an extending inflammation, and restoration to complete health even is made possible." This is certainly a very optimistic view of the situation and I earnestly hope it may become the experience of all careful observers. Until that time however, the burden of proof is on the one who makes the statement, never mind how distinguished he may be. Each minute step in diagnosing the condition as one of chronic parenchymatous nephritis should be given in detail, while the previous history of the patient should be recorded in every way known to careful observers and the condition of the urine studied and tabulated for several months at varying intervals. In other words before pelvic lavage is begun we must obtain a picture of the disease perfect in every part and over which there can be no quibbling

afterward. During the lavage the same care for details should be carried out. After the treatment is completed and the patient considered cured, at least a year better be allowed to elapse, during which time systematic observations should be made, before a complete and final report is published. By the above mode of procedure a report could be made which would meet the most searching investigation. The reports of chronic parenchymatous nephritis disappearing under lavage of the renal pelvis are so astounding that one is temporarily made speechless. The logic of the method is, to my mind, absolutely wrong and I fail to see how it can ever do more than relieve some pathological conditions connected with the ureter and renal pelvis itself. I have yet to find in the literature of the subject authentic reports of cures of chronic parenchymatous nephritis.

I hope Dr. Johnson and all the others who are doing this work will publish fuller accounts of their investigations in this line, but at the same time describing their cases much more in detail step by step. In this manner only shall we obtain that which will be of positive value.

While I am profoundly interested in new methods of treatment connected with the cystoscope I feel that at present we are justified in reporting as cured only some pathological conditions of the ureter and renal pelvis.

Sincerely yours,

FOLLEN CABOT.

129 EAST 31ST STREET.

OBITUARY.

MAX NITZE

On March 1, 1904, notification was received from Hans R. Wossidlo that a celebration had been arranged for March 9th in honor of Nitze, to commemorate the twenty-fifth anniversary of the first public demonstration of the cystoscope.

The committee appointed by the physicians of Germany to take the celebration in hand and to prepare a congratulatory address consisted of Professor Carl Posner, Dr. Hans R. Wossidlo, and Dr. H. Goldschmidt.

This committee honored a member of the Association by delegating to him the invitation of the other members to send their signatures for reproduction in the address. The time available, however, was too short for more than a congratulatory cablegram. On March 9th the following message was sent:

"Professor Max Nitze, Berlin.

"Your colleagues and pupils congratulate themselves and the profession on the twenty-fifth anniversary of the demonstration of the cystoscope. Vivat Magister!"

This cablegram bore the names of some fifty members whose replies could be obtained in time. Their signatures, as well as those which arrived after March 9, 1904, were sent to the committee to be appended to the congratulatory address.

Personally and in correspondence during the past ten years Nitze often expressed the hope of visiting our country. Acting thereon, he was asked to prepare a paper for the American Urological Association. After several letters on the subject had crossed, the date was finally fixed for April 3, 1906, when a special meeting was to be called in his honor. He had given the title of his proposed paper: "Intravesical Removal of Tumors."

On February 18th Nitze cabled: "Verhindert," which, according to the code arranged, meant: "It will be impossible for me to go to New York, as agreed." Three days later the inventor of the modern cystoscope and many ingenious modifications thereof was stricken with apoplexy and died on the same evening.

The loss to science by Nitze's death is incalculable. His wonderful mechanical skill in devising special instruments rendered them so perfect for their purpose that, particularly under his tuition, their effective use for examination and treatment could be readily acquired.

De mortuis nihil nisi-verum: To those who were not intimately acquainted with Nitze he might appear somewhat cold and even unapproachable. Those, however, who were favored with his friendship knew him to be exceedingly frank and unassuming. In quiet evenings, after a hard day's work, Nitze dropped his very stiff "Herr Kollege," and at the most charming little suppers he gave he omitted professional titles in addressing his guests. While not the best of conversationalists, he strove to interest and entertain those with whom he associated. In consequence, most pleasant recollections were carried away by the pupils he had made forget that he was a great man.

Nitze is dead, but his work will live forever after him in the advances in cystoscopy, ureteral catheterism, the diagnosis of renal and bladder diseases, and intravesical operations.

Nitze was but fifty-seven years of age; he seemed a much younger man; his energy and restless striving for advances in urology were in keeping with his youthful appearance.

The American Urological Association loses its first Honorary Member by Nitze's death.

F. C. V.